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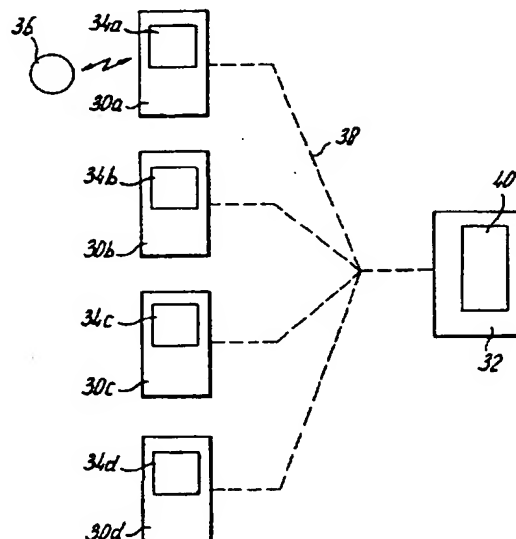
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(54) System for authorizing code carriers

(57) System for authorizing code carriers. The system comprises one or more interrogating stations which compare the code received from a code carrier with a series of identification codes stored in a memory, and a central processor which may communicate with said interrogating stations.

The central processor comprises a further memory in which a further series of identification codes can be stored. In case an interrogating station receives an identification code from a transponder which is not recognized in the station a communication connection with the central processor is established and the received identification code is transferred to the central processor where the code is compared with said further series of authorized identification codes.

fig-3



EP 0 716 399 A1

Description

The invention relates to a system for authorizing code carriers each carrying a unique identification code.

Such systems are in various embodiments known from the prior art and are applied for various different applications such as:

- access control for buildings or areas whereby only access is granted to the carrier of an authorized transponder,
- access control for vehicles for parking areas or parking garages whereby only access is granted to vehicles which comprise an authorized transponder,
- check on goods which are present in a warehouse and which are only allowed to leave the warehouse if they comprise an authorized transponder,
- check on persons which are under house arrest and visitors of such persons,
- the use of certain apparatuses or machines only allowed to those persons which have a predetermined code carrier, etc..

In a known embodiment such as for instance described in US 4216375 and 4248690 of such a system the interrogating stations are through a cable of wireless network in permanent communication connection with the central processor. The interrogating stations transmit each received identification code to the central processor to be compared with the series of authorized identification codes whereafter, in case correspondence between the received code and one of the stored authorized codes is detected, a return signal is transmitted back to the respective interrogating station to generate there an authorization signal granting the holder of the code carrier for instance access to an industrial area.

The disadvantage of this embodiment is the permanent communication connection between each of the interrogating stations and the central processor. Applying such a system on a large scale, for instance in an industrial site or something similar, would, especially in relation to the permanent communication connections lead to significant costs. Application in a situation with more buildings or sites which are situated at a distance of each other, will for this reason alone not be very obvious. Such systems are in general therefore only used in small scale applications.

In a further embodiment of such a system, see US 4831374, the interrogating stations do function mainly independent. Each of the interrogating stations comprises a memory in which a series of authorized identification codes is stored and each interrogating station comprises means to compare the received code with the series of stored codes to establish if the received code belongs to the series. In this embodiment the eventual communication connection with the central processor is only used to "update" the stored codes from time to time, i.e. eventually to change or correct the codes.

In this known system there is no permanent communication connection present between each of the interrogating stations and the central processor. In case the data in each of the interrogating stations should be updated then a communication connection is established between the central processor and the respective interrogating station, for instance through the normal telephone network. A disadvantage of such a system is that for instance in case of loss or theft of a transponder it is not possible to take direct action to disable the code of said code carrier. It is also hardly possible to authorize a code carrier with a code, which is normally not authorized, for instance only temporary for a predetermined period. That is only possible in case said predetermined period overlap an update period.

An object of the invention is now to provide a system whereby no permanent communication connection is necessary between the central processor and the interrogating stations, however, enabling updating of the codes present in the interrogating stations in a flexible manner and enabling temporary authorization of codes which are normally not authorized.

In agreement with said object a system is provided comprising:

- one or more interrogating stations comprising means for reading the identification code carried by said code carrier, a memory in which a series of authorized identification codes can be stored and means to compare the identification code received from the code carrier with said series of authorized identification codes stored in said memory whereby in case the identification code received from the code carrier is recognized in the series of identification codes stored in the memory the interrogating station outputs an authorization signal,
- a central processor comprising a further memory in which a further series of identification codes can be stored,
- a communication network by means of which the interrogating stations are able to transmit data to the central processor and by means of which the central processor is able to transmit data to one or more interrogating stations,

whereby in case an interrogating station receives an identification code from a code carrier which does not belong to the series of identification codes stored in the memory of said interrogating station a communication connection with the central processor is established and the received identification code is transmitted to said central processor where the identification code is compared with said further series of authorized identification codes, whereafter in case the received identification code belongs to said further series a return signal of the first type is transmitted through the communication network to the respective interrogating station to generate an authorization signal, and in the other case a return

signal of the second type is transmitted not evoking the generation of an authorization signal.

The invention will be described in more detail with reference to the attached drawings.

Figure 1 illustrates a first prior art system.

Figure 2 illustrates another prior art system.

Figure 3 illustrates a first embodiment of a system according to the invention.

Figure 4 illustrates a second embodiment of a system according to the invention.

Hereafter with reference to the figures a specific application of the invention in a system for access control will be discussed although the invention is not restricted thereto.

In figure 1 a first prior art system is illustrated comprising a number of interrogating stations 10a ... 10d which through a permanent communication connection 18 are connected to a central processor 12. The communication connection 18 can for instance be established through a cable connection. In the central processor 12 a memory 14 is present in which authorized identification codes are stored. Each of the interrogating stations 10a ... 10d is located near the access (entrance or exit) to a terrain, building or something similar, and is destined to enable access for persons, goods, animals etc. which do have a transponder in which an authorized identification code is stored. In figure 1 such a transponder is schematically indicated by 16.

In this prior art system the interrogating stations 10a ... 10d are continuously transmitting interrogating signals. As soon as a transponder 16 moves within the interrogating field the transponder will be activated by said interrogating field and will start transmitting the identification code stored in the transponder. The respective interrogating station 10b receives said identification code and transmits the code through the communication connection 18 to the central processor 12 where the received code is compared with the series of codes stored in the memory 14. If during said comparison it is established that the received code is indeed authorized, then the processor 12 returns a signal to the interrogating station 10b which in response thereto provides access for instance by unlatching a lock, opening a gate, raising a barrier etc.. Further details of such a system are considered to be known to the expert in this field.

An other prior art system is schematically illustrated in figure 2. This prior art system comprises a number of interrogating stations 20a ... 20d and a central processor 22. In this embodiment each interrogating station comprises an own memory 24a ... 24d in which authorized identification codes are stored. When a transponder 26 moves to within an interrogating field of one of the interrogating stations, for instance interrogating station 20c, then the transponder 26 will be activated by the interrogating field to transmit its own identification code. In the interrogating station the identification code is compared with the series of codes which is stored in the memory 24c. If it is established thereby that the received code is

an authorized code, then the station 20c will take the necessary measures to grant access.

The central processor 22 has the possibility to get into contact with each of the interrogating stations 20a ... 20d through a communication network 28. This is done for instance once a day in such a manner that the central processor 22 calls each of the interrogating stations checking thereby whether the identification data stored in the respective memory 24a ... 24d are still correct or need correction or amendment.

Figure 3 illustrates a first embodiment of a system according to the invention. This system comprises a number of interrogating stations 30a ... 30d, each having an own code memory 34a ... 34d. Furthermore the system comprises a central processor 32 also having its own code memory 40. Through the communication network 38 connections can be built up between the central processor 32 and each of the interrogating stations 30a ... 30b.

If a transponder 36 moves into the interrogating field of one of the interrogating stations, for example the station 30a, then the transponder 36 shall be activated by the interrogating field to transmit its own identification code. This identification code is received in the interrogating station 30a and compared with the series of codes which are stored in the memory 34a. If it is established thereby that the received code belongs to the series of authorized codes, then the interrogating station 30a takes measures to grant access.

However, if during the comparison it is established that the received code does not belong to the series of stored codes, then the interrogating station 30a builds up a connection with the central processor 32 through the network 38. The central processor 32 comprises a memory 40 in which further identification codes are stored. As soon as the connection is made the code, which was not recognized as authorized in the station 30a is transmitted to the central processor 32 in which the received code is compared with the series of codes which is stored in memory 40. If it is thereby established that the received code is present in the memory 40, then the processor 32 transmits a return signal of the first type to the interrogating station 30a indicating thereby that this transponder may be granted access. However, if the received code is not found in the memory 40, then another return signal of a second type is transmitted back indicating to the interrogating station 30 that access has to be denied.

In the system the memories 34a ... 34d contain the identification codes of transponders which always should have access. In case the system is for instance applied on a factory site with entrances for personnel and entrances for incoming and outgoing goods, then for instance each staff member has a transponder with authorized identification code with help of which the respective staff member can have access to the site without hindrance. The authorized identification codes are stored in the interrogating stations at the entrances/exits which are used by the staff members.

As long as the respective staff member carries the transponder said exits or entrances may be used freely.

On the other hand within this system transponders may be used which provide a temporary access. One may think of people which are not directly on the pay-role of the respective company or have to be in the respective building regularly, such as representatives, suppliers, visitors or other persons which should be granted access only once or at least less frequent. Suppliers for instance could have transponders granting access to the site within predetermined periods. Such transponders, granting only access within predetermined periods, are programmed with identification codes which are stored in the memory 40 of the central processor 32. With each of these identification codes in the memory 40 one or more time indications are stored indicating within which period or periods the owner of the transponder with the respective identification code may be granted access. Only in case the transponder is interrogated within an allowed period a return signal of the first type is transmitted back to the interrogating station where the transponder is interrogated and access is granted. However, if the transponder is interrogated outside an allowed period (or periods) then the connection with the processor 32 will be built up, the code will be compared with the second series of codes in the memory 40 and it will be established thereby that the interrogation time was outside the allowed period and as a result a return signal of the second type will be transmitted back indicating to the respective interrogating station to deny access.

Preferably the system is embodied such that each time when a transponder is interrogated by an interrogating station and the identification code is recognized either in the interrogating station itself or in the central processor 32, then for instance the time at which the interrogation took place will be registered in relation to the respective identification code either in the interrogating station or in the central processor 32. By registering the time moments at which a certain transponder is interrogated by one of the interrogating stations a kind of supervising function can be carried out. In relation to staff members it is possible therewith to check their attendance. In case of suppliers, visitors and other carrying a transponder of which the identification code is stored in the memory 40 of the central processor 32 it is for instance possible through these time registrations to check when a supplier delivered his goods, when the transport undertaking retrieved his goods and how long a visitor was present within a building or on the site.

In case of loss or theft of a transponder it is possible in this system to delete the respective identification code from the memories 34a ... 34d or from memory 40. However, it is preferred in case of loss or theft to maintain the identification code in the memory, however to add an invalid code thereto. If the respective transponder is thereafter interrogated by one of the interrogating stations 30a ... 30d then the code will be recognized however with this recognition it will be established on the ground of the added invalid code that nevertheless no

access should be allowed. If the recognition is carried out in one of the interrogating stations then preferably an alarm signal is generated informing the porter or other surveyance personnel of the fact that the interrogated transponder was indicated as lost or stolen. If the recognition is carried in the central processor then in such a case preferably a return signal of a third type is transmitted back to the respective interrogating station where on the one hand access is denied and on the other hand said alarm signal is generated to alarm either the surveyance personnel or the porter.

In the same manner it is however possible with less trouble to provide temporary access to a transponder. In that case it is only necessary to store the respective identification code in the memory 40 of the central processor 32.

It is already pointed out above that for instance suppliers which are delivering goods or transport firms which come to collect goods can be granted access within a predetermined time period. It is furthermore possible to restrict the maximum access time to a predetermined time duration, which time duration is sufficient for delivering the goods respectively for taking away the goods. In that case together with the authorization code of the respective transponder not only time period information is stored but also time duration information indicating how long the passage will be possible after access is granted. If for one reason or another a supplier needs more time than said time duration he can go back to the interrogating station. If the transponder is then interrogated within the predetermined allowed period and is recognized as authorized again then from that time on again access is granted and passage is possible during said predetermined time duration. If however in the meantime the predetermined time period is lapsed then further access is not granted. Therewith it is possible to a supplier to be on the site or within the building during a longer time duration but this fact will be registered and can be recognized afterwards.

Preferably the central processor but eventually also at least part of the interrogating stations comprises a peripheral with which it is possible to visualize the registrations and the memories, i.e. the moments of time (and eventually an identification of the interrogating station in case of registration in the central processor) at which the interrogating station interrogated the various transponders. In this respect one may think of a display unit on which the identification codes with their corresponding interrogation time moments can be made visible as a list. One may think furthermore of a printer which prints a list of the interrogated identification codes together with the interrogation time moments. Of course it is also possible to provide each of the interrogating stations with an output connection from which the respective data can be read for instance and can be stored in a temporary data acquisition unit to be processed for instance afterwards in a separate computer.

In relation to the communication channels 38 it is remarked above only, that a communication connection

can be established between one of the stations 30 and the central processor 32 in case such a connection is necessary. Such a connection can be established for instance through a telephone connection or through another data communication path which is maintained as long as necessary to exchange data between the interrogating station and the central processor and vice versa. It is also possible to use simplex connections whereby the interrogating station supplies the data with the address of the central processor 32 to the communication network whereafter the data can be received by the processor after which the communication ends. In the same manner the central processor after completing the comparison process can transmit the return signal together with the address of the respective interrogating station through the communication path whereafter it will be received and processed by the interrogating station.

Other forms of communication are possible as long as the data are transmitted from the interrogating station to the central processor respectively from the central processor to the interrogating station.

Above it is more or less taken for granted that the interrogating stations 30a ... 30d are for instance related to one single industrial site, office etc.. However, it is also possible that the interrogating stations in a geographical sense are more or less remotely located. One may think of a large company having more sites whereby each site comprises one or more interrogating stations which all can make contact with one central processor 32 located somewhere in the country and not necessarily onto one of the sites.

In a further embodiment one central processor 32 is used to guard the sites and offices of a number of companies. In figure 4 such an embodiment is schematically illustrated.

The system illustrated in figure 4 comprises a number of interrogating stations 46a ... 46e each having a code memory 44a ... 44e, which interrogating stations are located at one or more entrances/exits of one or more sites or buildings of a first company. Furthermore the system comprises a number of interrogating stations 50a, 50b, 50c, each having a code memory 48a, 48b, 48c which interrogating stations are located at the entrances/exits of one or more sites or buildings of a second company. The interrogating stations 54a and 54b each with a code memory 52a, 52b are located at one or more entrances/exits of sites or buildings of a third company. All interrogating stations illustrated in figure 4 are through a communication network 58 connected to a central processor 42 which comprises an identification code memory 56. It will be clear that the number of companies and the number of identification stations at wish can be enlarged or diminished. In this way one central post 42 is in command over the interrogating stations of a large number of companies whereby per company identification stations can be used at a number of sites and/or buildings. For the communication network 58 use can be made of the normal telephone network, the wire-

less telephone network, the car telephone network, a data net or another suitable communication path.

It is remarked that for instance a supplier which supplies goods to more than one company needs only one single transponder to get access at various different companies. The only condition is that the code of his transponder is programmed in the memories of the interrogating stations (or central processor) so that his responder can be recognized at all the various places.

Although above the application of the invention in a system for access control is discussed there are a number of other possibilities as already remarked. A part of the interrogating stations can be installed for instance near apparatuses or machines which may only brought into action by the holder of an authorized code carrier. Within an industrial environment or a manufacturing company one may think of specialized apparatuses which have to be operated by predetermined experts. Each of these experts has to be in the possession of a code carrier with an authorized code. Only these experts are able, by offering the code carrier to the responding interrogating station, to activate the respective machines. Also the activating or deactivating of alarm circuits of a security installation on a predetermined area or within a predetermined building can be authorized in this way.

The attention is furthermore drawn to the fact that code carriers of various different types can be used such as E.M. transponders, magnetic cards, optically readable bar codes, etc..

Claims

1. System for authorizing code carriers each carrying a unique identification code, comprising:

- one or more interrogating stations comprising means for reading the identification code carried by said code carrier, a memory in which a series of authorized identification codes can be stored and means to compare the identification code received from the code carrier with said series of authorized identification codes stored in said memory whereby in case the identification code received from the code carrier is recognized in the series of identification codes stored in the memory the interrogating station outputs and authorization signal,
- a central processor comprising a further memory in which a further series of identification codes can be stored,
- a communication network by means of which the interrogating stations are able to transmit data to the central processor and by means of which the central processor is able to transmit data to one or more interrogating stations,

whereby in case an interrogating station receives an identification code from a code carrier

which does not belong to the series of identification codes stored in the memory of said interrogating station a communication connection with the central processor is established and the received identification code is transmitted to said central processor where the identification code is compared with said further series of authorized identification codes, whereafter in case the received identification code belongs to said further series a return signal of the first type is transmitted through the communication network to the respective interrogating station to generate an authorization signal, and in the other case a return signal of the second type is transmitted not evoking the generation of an authorization signal.

2. System according to claim 1, characterized in that each time a code carrier is recognized as authorized this fact is registered by storing the time and eventually the place where the recognition took place in connection with the identification code of the respective code carrier in the memory.
3. System according to claim 2, characterized in that the registration of each recognition is carried out in the interrogating station in case the identification code belongs to the series of identification codes stored in said interrogating station and is carried out in the central processor in case the identification code belongs to the further series of identification codes stored in the central processor.
4. System according to claim 3, characterized in that the central processor comprises a peripheral for visualizing stored registrations.
5. System according to claim 3, characterized in that at least a part of the interrogating stations comprises a peripheral for visualizing the stored registrations.
6. System according to claim 4 or 5, characterized in that the peripheral is embodied as a printer and/or a display unit.
7. System according to one of the preceding claims, characterized in that with each identification code in one of the first series in the interrogating stations or in the further series in the central processor one or more time period indications can be stored indicating for which time period the related identification code in the memory after recognition thereof should be considered as authorized or not.
8. System according to claim 7, characterized in that in case in the central processor the comparison of a received identification code takes place within an allowed time period a return signal of the first type is generated or in the other case a return signal of the second type is generated.

9. System according to one of the preceding claims, characterized in that an invalid code can be added to each identification code in one of the first series and that in case such an identification code during a comparison corresponds with a received identification code a warning signal is generated.
10. System according to one of the preceding claims 1-9, characterized in that an invalid code can be added to each identification code in the second series, and that in case such an identification code during comparison corresponds to a received identification code a return signal of a third type is transmitted back on the basis of which the respective interrogating station does not deliver an authorization signal but delivers a warning signal.
11. System according to one of the preceding claims, characterized in that the code carrier consists of a passive transponder which under the influence of an interrogating field with suitable frequency is activated to transmit a preprogrammed identification code and that the interrogating stations comprise means for generating such an interrogating field.
12. System according to one of the preceding claims, characterized in that the code carrier consists of a carrier onto which or into which a magnetic code is established, for instance a card carrying a magnetic strip, and that the interrogating stations comprise means to read said magnetic code.
13. System according to one of the preceding claims, characterized in that the code carrier consists of a carrier onto which or into which an optical code is established, for instance a bar code, and that the interrogating station comprise means to read said optical code.
14. System according to one of the preceding claims, characterized in that at least part of the interrogating stations is located near one or more entrances/exits of one or more terrains, buildings or parts thereof and that the authorization signal generated by an interrogating station is used to unlock the respective entrance/exist to let the person holding the code carrier pass.
15. System according to one of the preceding claims, characterized in that at least part of the interrogating stations is located nearby apparatuses or machines which can only be operated after being enabled by an authorization signal from the related interrogating station.

fig-1

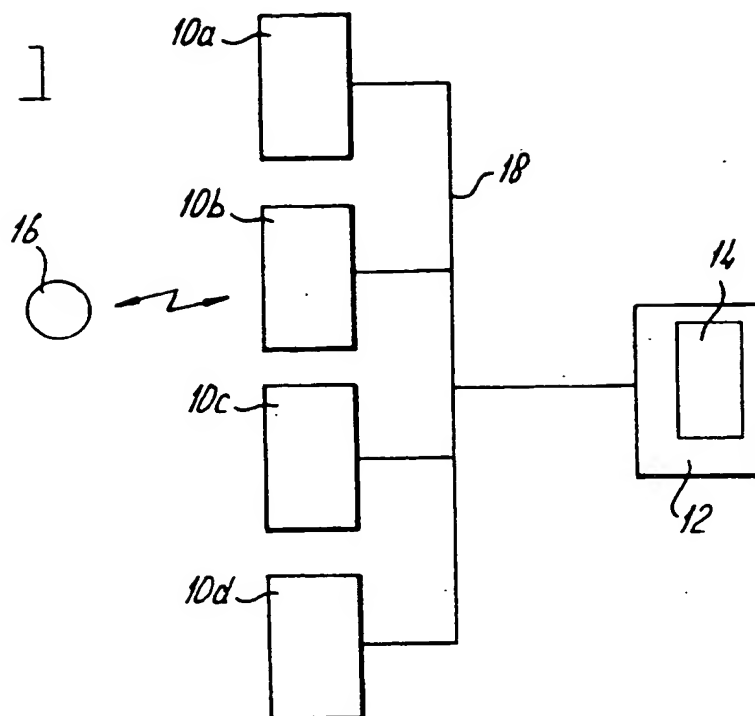


fig-2

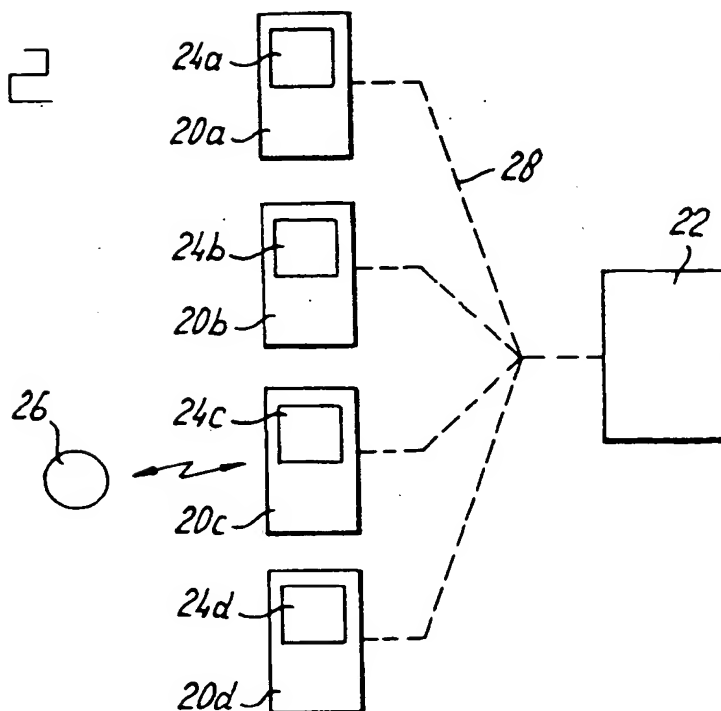


fig - 3

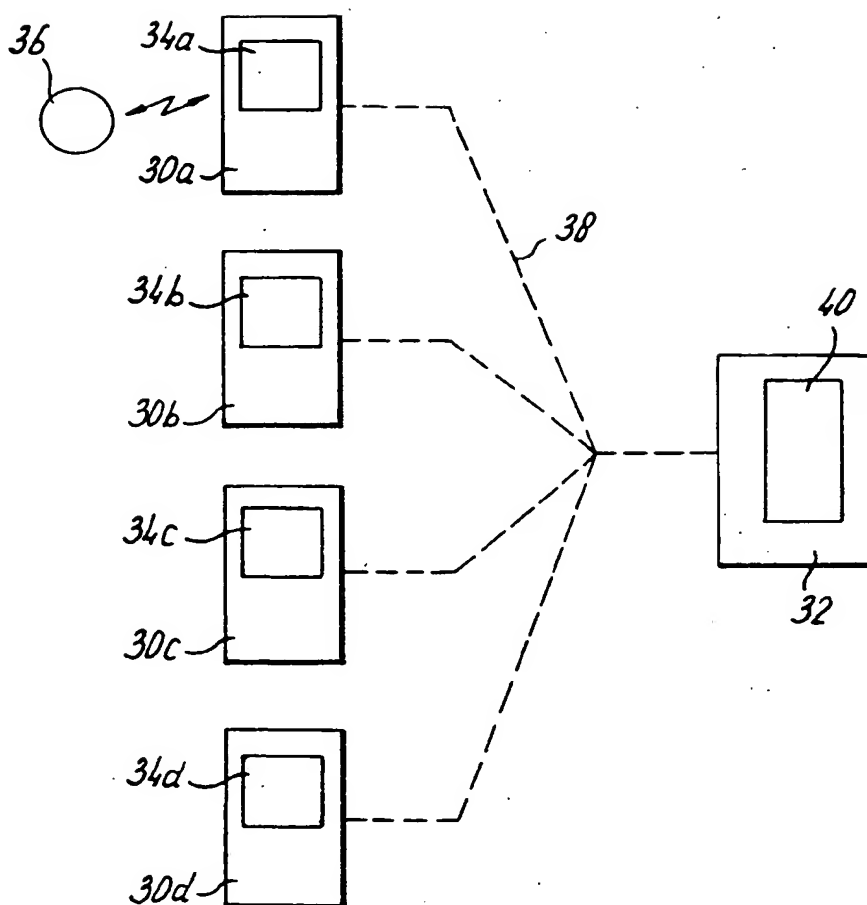
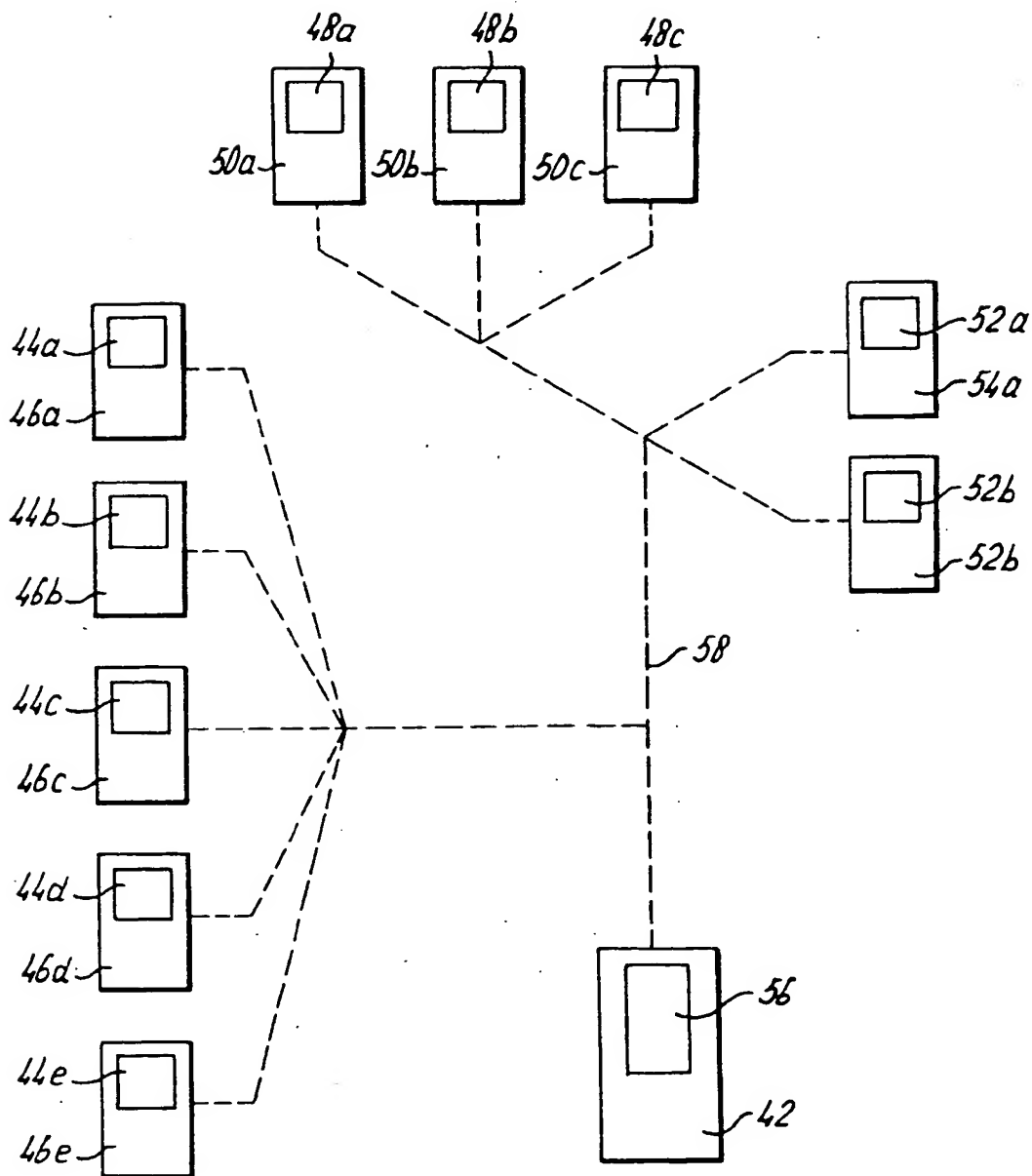


fig-4





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 3382

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	US-A-4 216 375 (ULCH,B.D. ET AL.) 5 August 1980 * column 3, line 47 - line 53 * * column 4, line 34 - line 47 * * column 6, line 23 - line 28 *	1,2,7,8,12,14	G07C9/00 G06K19/06
A	---	4,6	
D,X	US-A-4 218 690 (ULCH,B.D. ET AL.) 19 August 1980 * column 3, line 24 - line 29 * * column 4, line 37 - line 47 * * column 9, line 56 - line 64 *	1-4,6-8,12	
A	US-A-4 142 097 (ULCH,B.D.) 27 February 1979 * the whole document *	1	
D,A	US-A-4 831 374 (MASEL,B.) 16 May 1989 * the whole document *	1,2,4,13	
A	DE-A-43 08 193 (SIEMENS AG) 22 September 1994 * claims 1,2,4,15 *	2,5,9,11	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G07C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 March 1996	Examiner Herskovic, M
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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